

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,710,831 B1
 DATED : March 23, 2004
 INVENTOR(S) : Bruce Winker et al.

Page 1 of 12

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Delete Title page illustrating a Drawing Figure, and substitute therefor Title page illustrating a Drawing Figure. (Attached)

Delete Drawing Sheets 1-10, to be replace with Drawing Sheets 1-10. (Attached)

Title page,

Item [56], **References Cited**, OTHER PUBLICATIONS, delete the following:

"Saji, T., et al., "Short-Term Hemodynamic Effect of a New Oral PG12 Analogue, Beraprost, in primary and Secondary Pulmonary Hypertension," Am.J. Cardio. 78:244-247 (1996)

Sakoda, T., et al., "Myristoylation of endothelial cell nitric oxide synthase is important for extracellular release of nitric oxide," Mol. Cell. Biochem. 152:143-148 (1995).

Sandig, V., and Strauss, M., "Liver-directed gene transfer and application to therapy," J. Mol. Med. 74:205-212 (1996)."

Below **ABSTRACT**, "6 Claims, 18 Drawing Sheets" should read -- 9 Claims, 10 Drawing Sheets --.

Column 14,

Line 25, add claims 7-9 as follows:

7. A tunable mirror comprising:

a negative quarter-wave to positive quarter-wave ($\pm\lambda/4$) retarder, being controllably switchable between $-\lambda/4$ and $+\lambda/4$ states of operation,

whereby in the $+\lambda/4$ state, said retarder circularly polarizes linearly polarized light of a first linear direction to circularly polarized light of a first rotational direction, and linearly polarizes circularly polarized light of the first rotational direction to linearly polarized light of the first linear direction, and, in the $-\lambda/4$ state, said retarder linearly polarizes circularly polarized light of a second rotational direction to linearly polarized light of the first linear direction; and

a cholesteric reflector optically aligned with the $\pm\lambda/4$ retarder, for reflecting circularly polarized light received from the $\pm\lambda/4$ retarder having a polarization of the first rotational direction, back through the $\pm\lambda/4$ retarder, and transmitting circularly polarized light of the second rotational direction towards the $\pm\lambda/4$ retarder,

such that the tunable mirror reflects linearly polarized light of the first linear direction, received through the $\pm\lambda/4$ retarder from a side opposite the cholesteric reflector when the $\pm\lambda/4$ retarder is in the $+\lambda/4$ state, and transmits circularly polarized light of the second rotational direction received through the cholesteric reflector, on a side opposite the $\pm\lambda/4$ retarder when the $\pm\lambda/4$ retarder is in the $-\lambda/4$ state.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

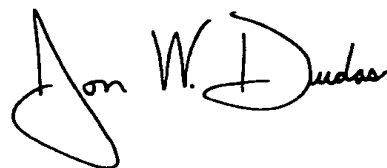
Column 14 (cont'd).

8. The tunable mirror of claim 7, wherein the cholesteric reflector is a diffuse reflecting cholesteric liquid crystal film.

9. The tunable mirror of claim 8, wherein the $\pm \lambda/4$ retarder comprises a $0-\lambda/2$ retarder and a $\lambda/4$ retarder.

Signed and Sealed this

Thirtieth Day of November, 2004

A handwritten signature in black ink, reading "Jon W. Dudas". The signature is stylized, with a large loop for the 'J' and a cursive 'Dudas'.

JON W. DUDAS
Director of the United States Patent and Trademark Office

(12) **United States Patent**
Winker et al.

(10) Patent No.: **US 6,710,831 B1**
(45) Date of Patent: **Mar. 23, 2004**

(54) **HIGH BRIGHTNESS TRANSFLECTIVE LCD AND METHOD USING TUNABLE MIRROR**

WO WO3701789 1/1997
WO WO9838547 9/1998
WO WO0063745 10/2000

(75) Inventors: **Bruce Winker, Ventura, CA (US); William J. Gunning, Newbury Park, CA (US)**

(73) Assignee: **Rockwell Scientific Licensing, LLC, Thousand Oaks, CA (US)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 300 days.

(21) Appl. No.: **09/676,138**

(22) Filed: **Sep. 29, 2000**

(51) Int. Cl.⁷ **G02F 1/13**
(52) U.S. Cl. **349/115**
(58) Field of Search **349/115, 77, 74, 349/113, 114**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,093,356 A	6/1978	Bigelow	350/338
4,398,805 A	8/1983	Cole	350/345
5,146,355 A	9/1992	Prince et al.	359/50
5,182,663 A *	1/1993	Jones	349/113
5,504,603 A	4/1996	Winker et al.	359/73
5,612,801 A *	3/1997	Winker	349/119
5,731,886 A	3/1998	Taber et al.	359/65
5,796,454 A	8/1998	Ma	349/98
5,808,711 A	9/1998	Suppelsa et al.	349/74
5,923,456 A	7/1999	Tench et al.	359/266
5,982,465 A	11/1999	Saxena et al.	349/119
6,008,871 A	12/1999	Okumura	349/61
6,039,451 A	3/2000	Grave	362/29
6,144,359 A	11/2000	Grave	345/102
6,437,900 B1 *	8/2002	Cornelissen et al.	359/246

FOREIGN PATENT DOCUMENTS

JP	05203937 A1 *	8/1993	349/113
JP	10206844	7/1998	
JP	2000221544	11/2000	

OTHER PUBLICATIONS

Machine translation of 10-206844 pp. 1-20.*

Saji, T., et al., "Short-Term Hemodynamic Effect of a New Oral PGI₂ Analogue, Beraprost, in Primary and Secondary Pulmonary Hypertension," *Am. J. Cardio.* 78:244-247 (1996).

Sakoda, T., et al., "Myristoylation of endothelial cell nitric oxide synthase is important for extracellular release of nitric oxide," *Mol. Cell. Biochem.* 152:143-148 (1995).

Sandig, V., and Strauss, M., "Liver-directed gene transfer and application to therapy," *J. Mol. Med.* 74:205-212 (1996).

Polarization Manipulation with Retarders, Meadowlark Optics, p. 5.

Polarization Spoken Here, Meadowlark Optics, Nov. 6, 2000.

Retarders, Polarization Manipulation with Retarders, Meadowlark Optics, Jul. 20, 2000, p. 1-3.

Seminar M-12: Supertwisted-Nematic LCDs, Scheffer and Nehring, p. M-12/3-M12/39.

Cholesteric Reflectors With a Color Pattern, Wacker-Chemie Maurer, Kreuzer and Stohrer, SID 94 Digest, p. 399-402.

(List continued on next page.)

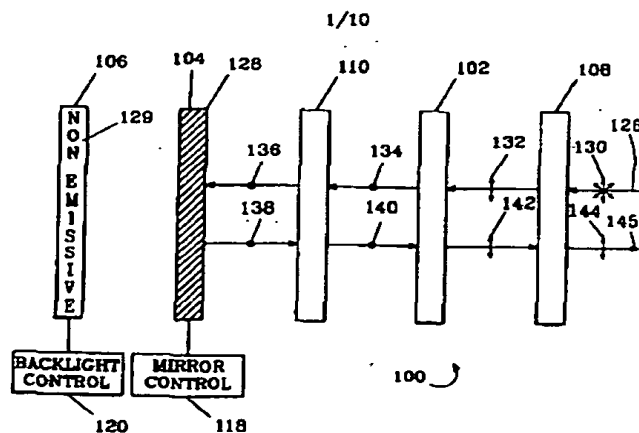
Primary Examiner—James A. Dudek

(74) Attorney, Agent, or Firm—Koppel, Jacobs, Patrick & Heyblk

(57) **ABSTRACT**

A Liquid Crystal Display (LCD) uses a tunable mirror in place of a partially reflective mirror. The tunable mirror has a controllable reflectivity and transmittance which allows the mirror to primarily reflect light when the LCD is operated in a reflective mode, and to primarily transmit light from a backlight when the LCD is operated in a transmissive mode.

6 Claims, 18 Drawing Sheets



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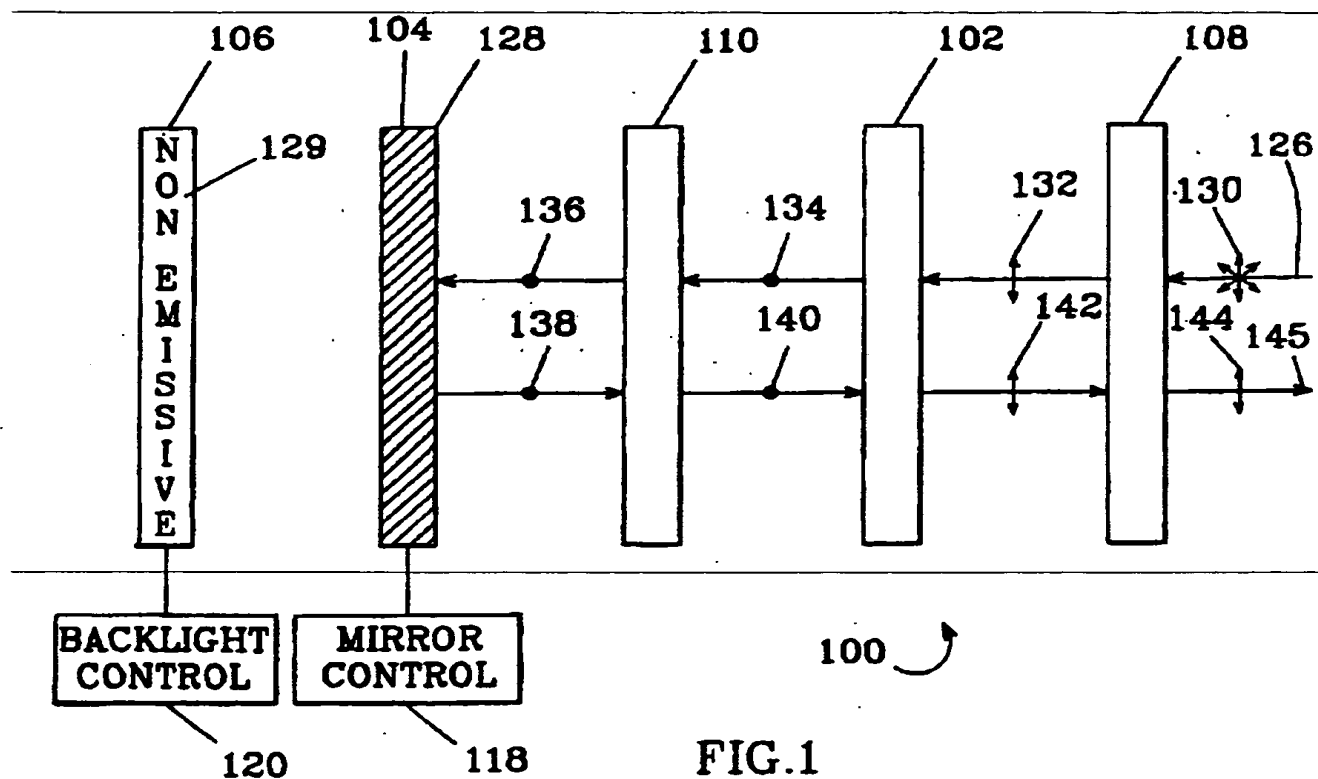


FIG. 1

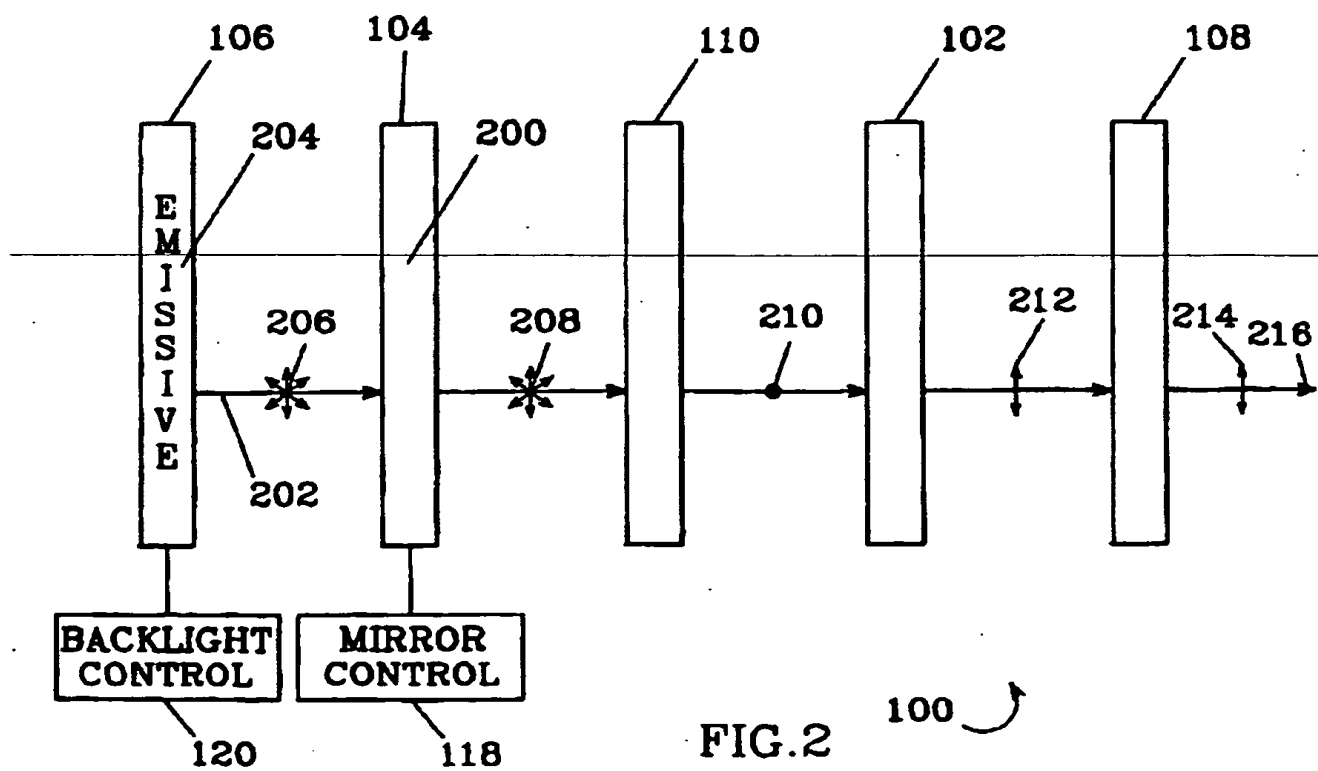


FIG. 2

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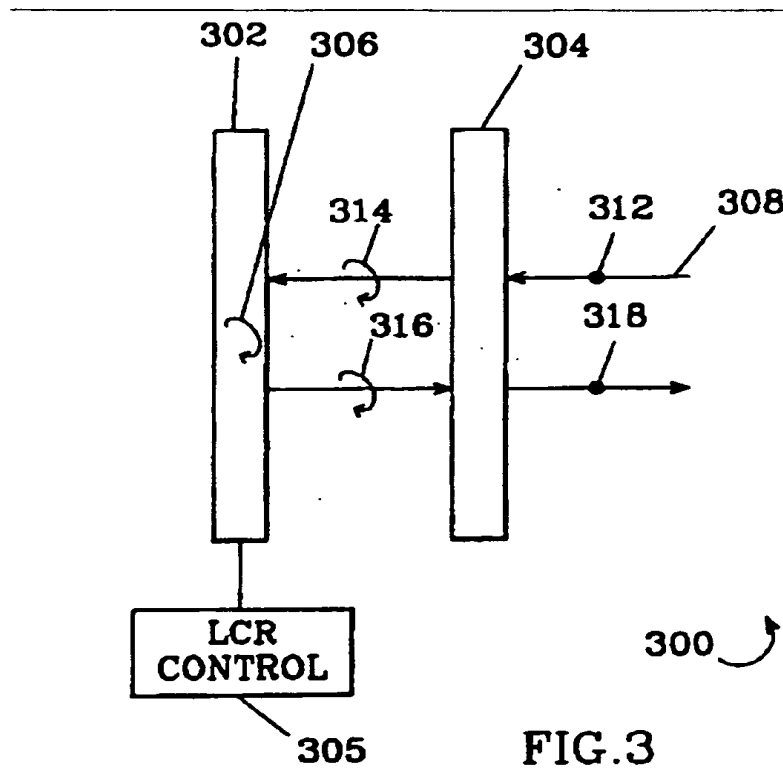


FIG. 3

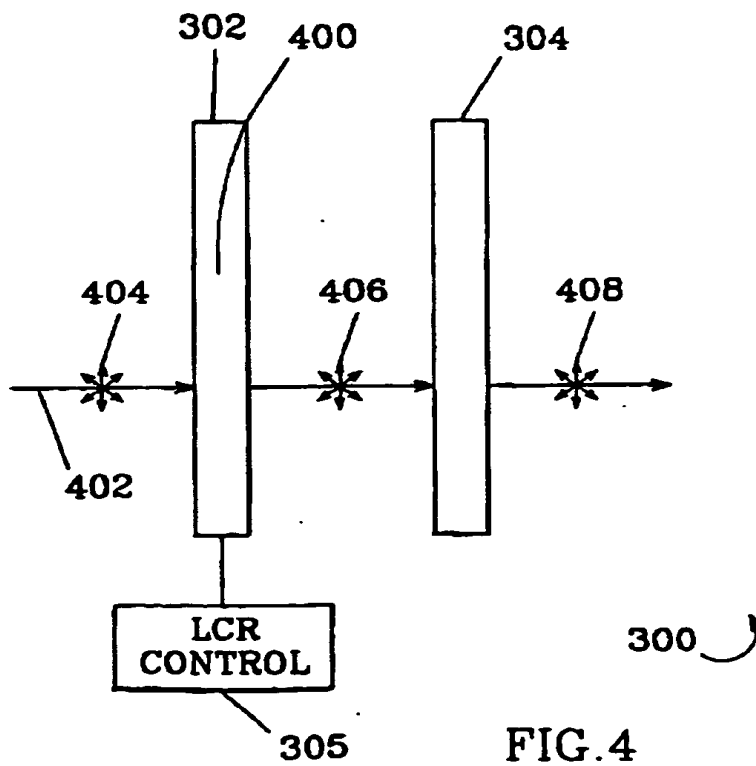


FIG. 4

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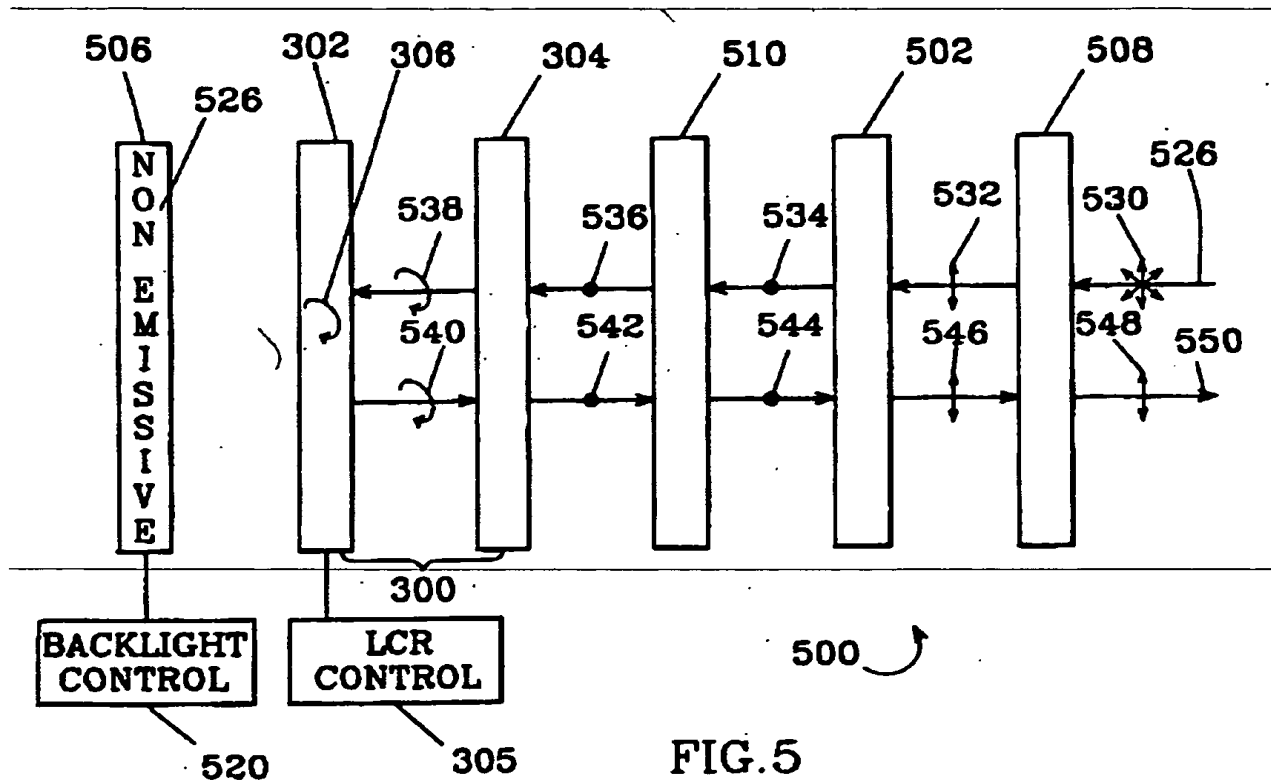


FIG. 5

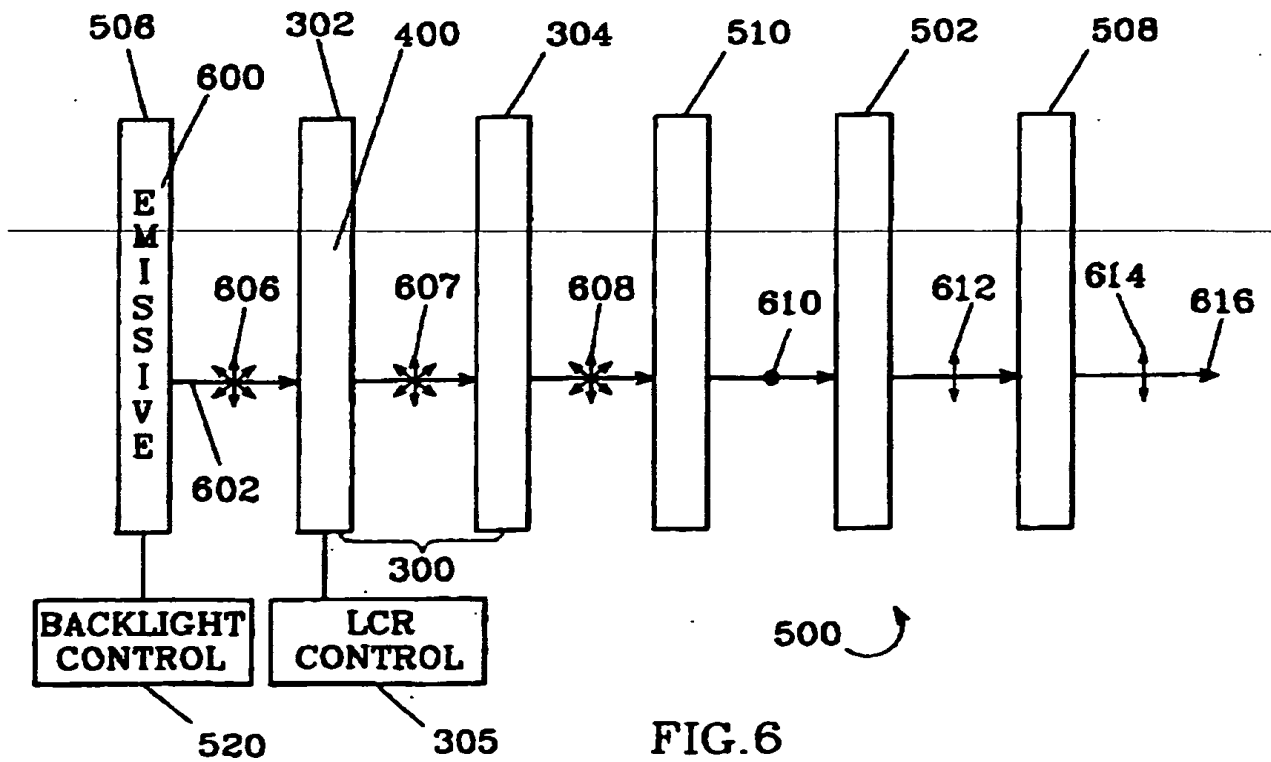


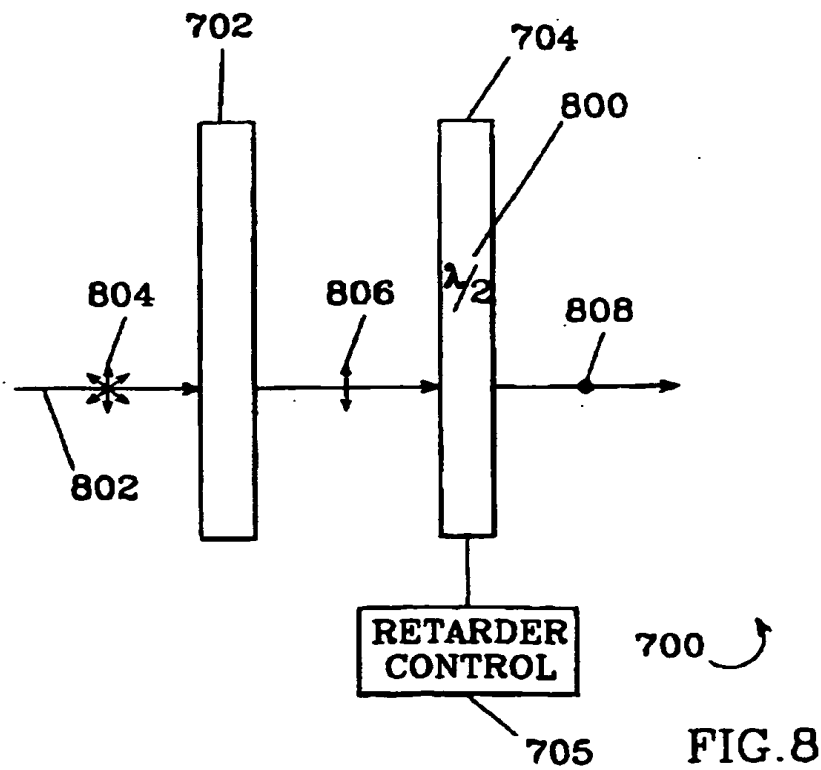
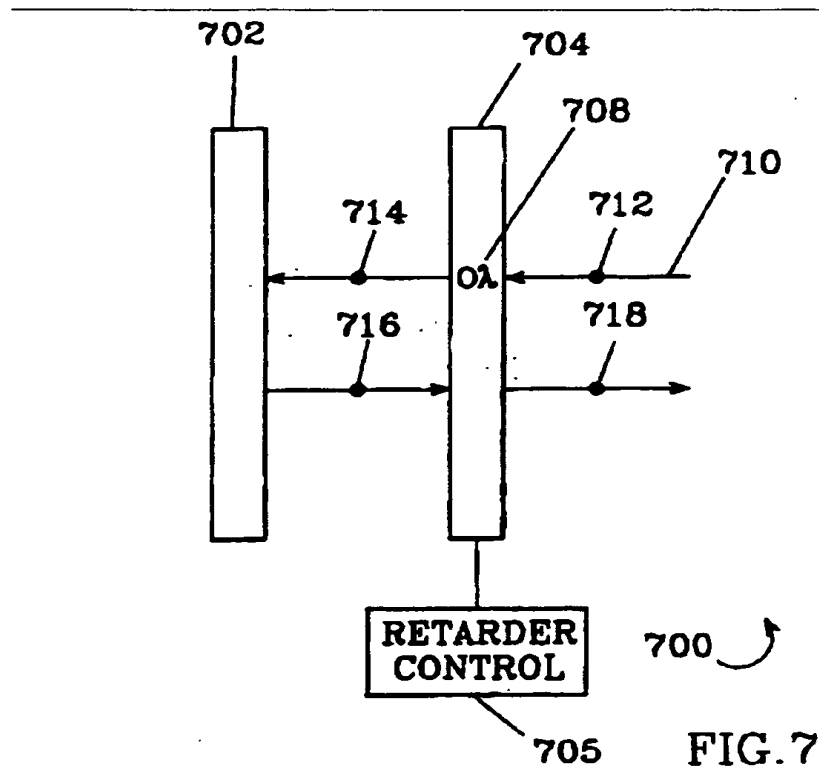
FIG. 6

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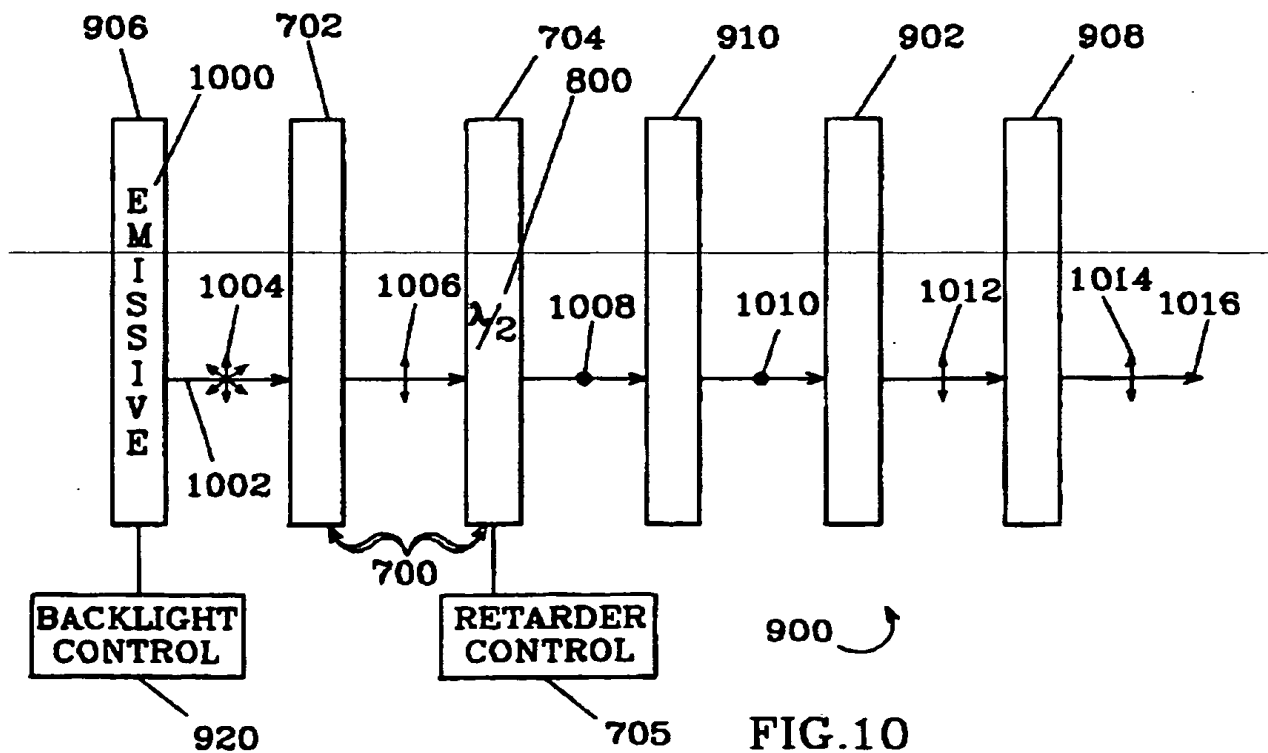
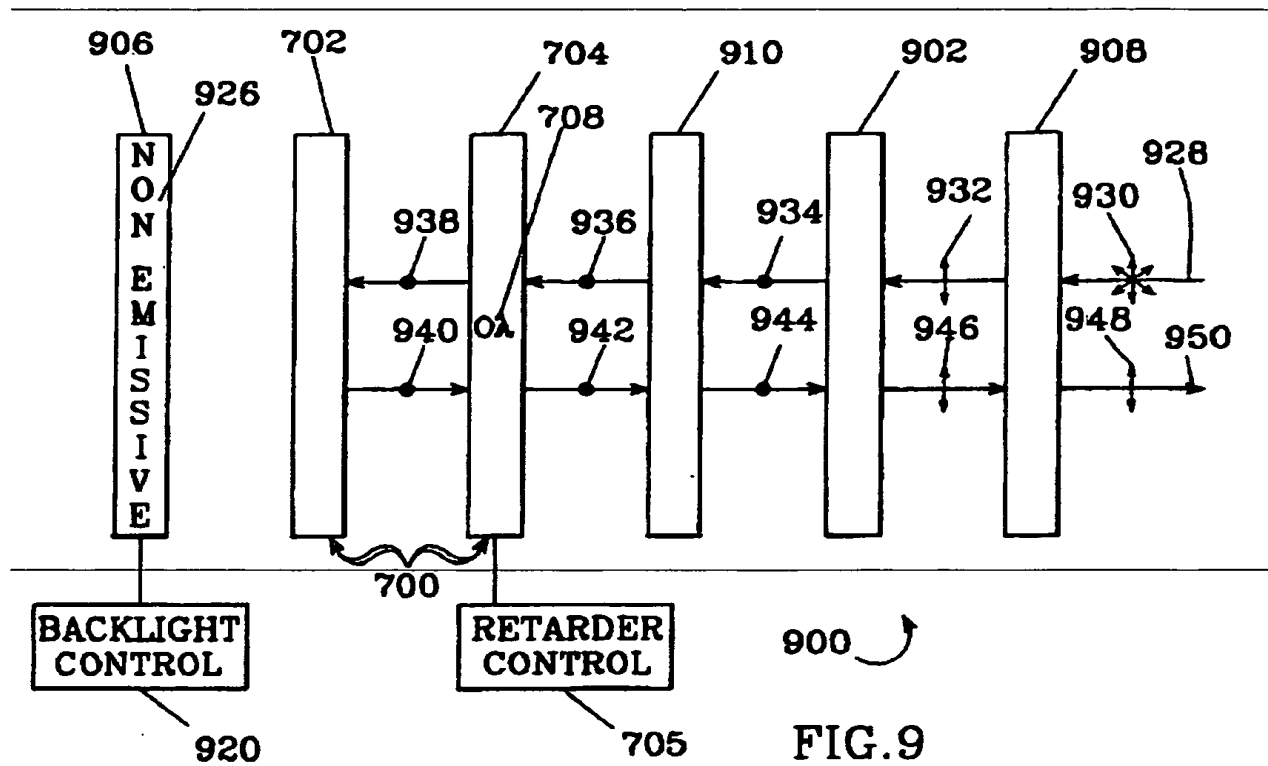


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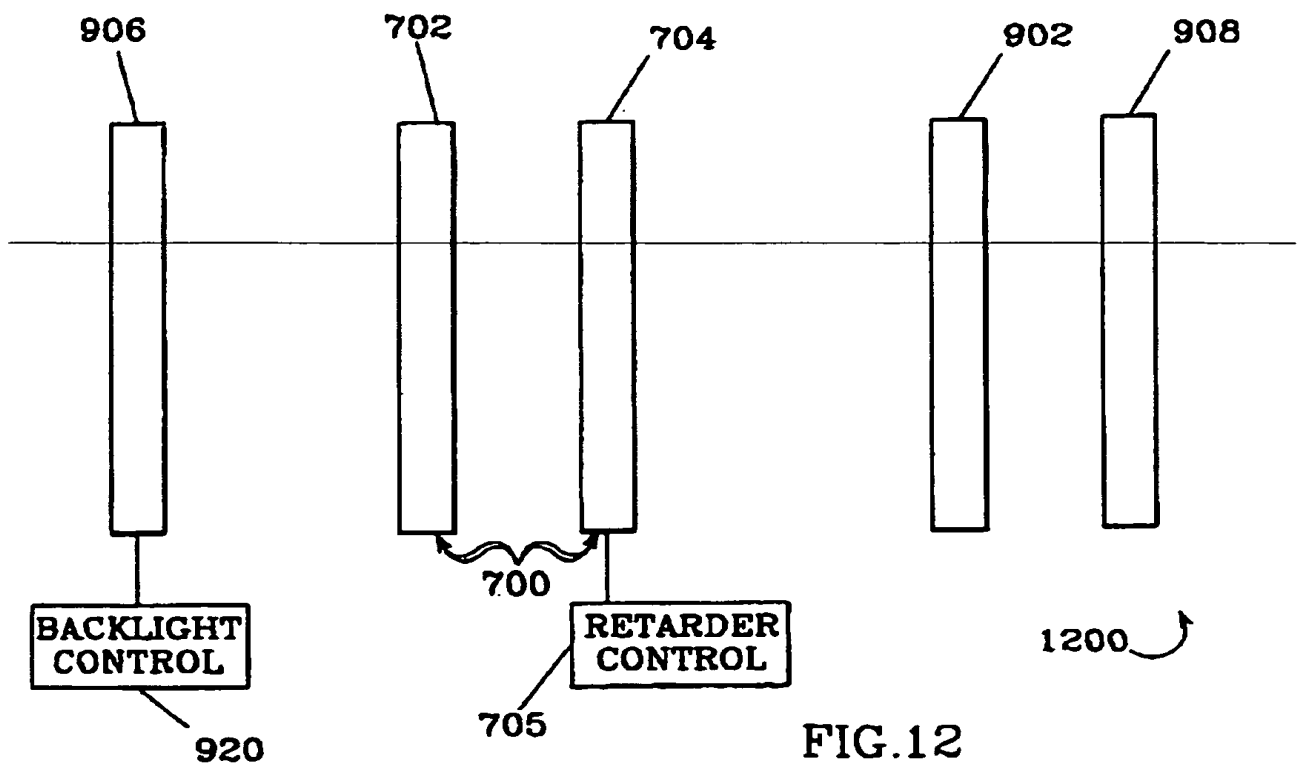
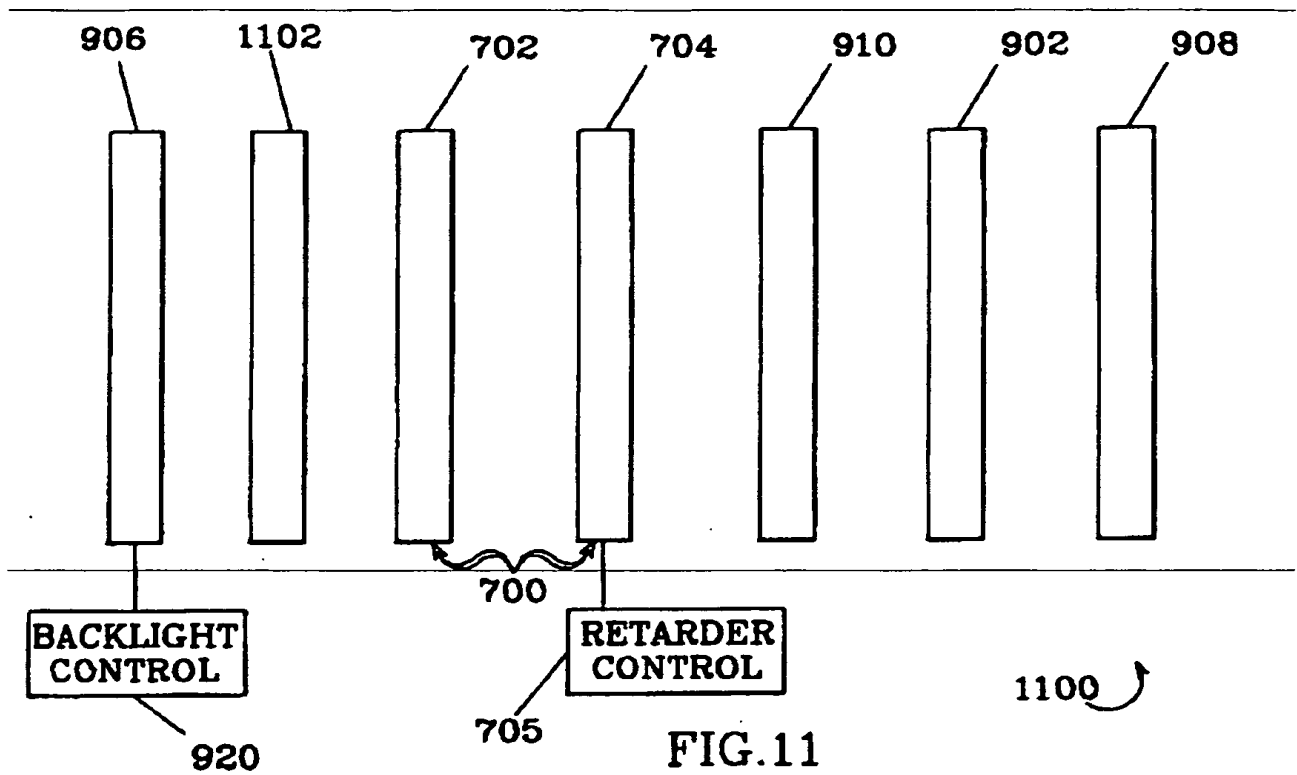


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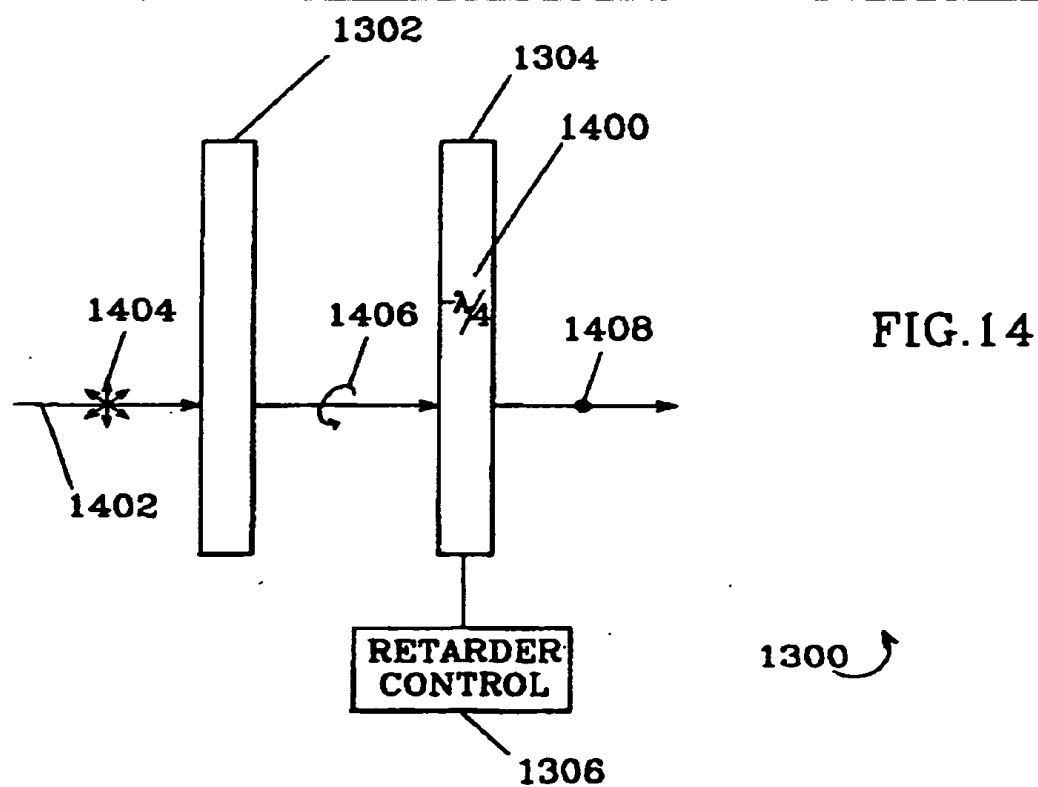
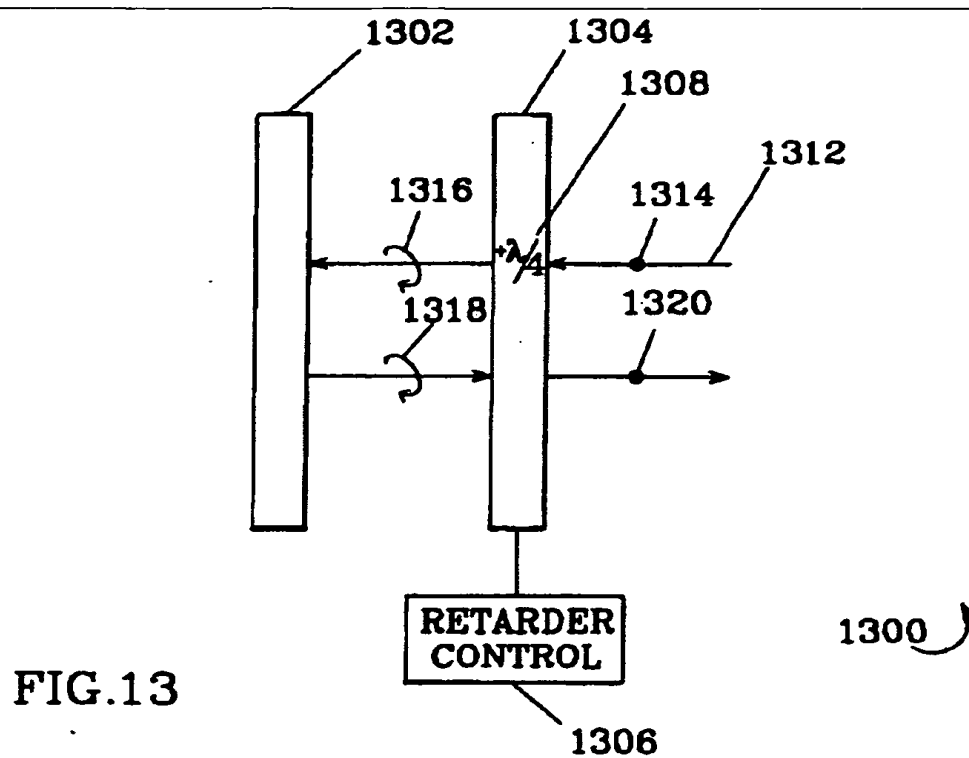


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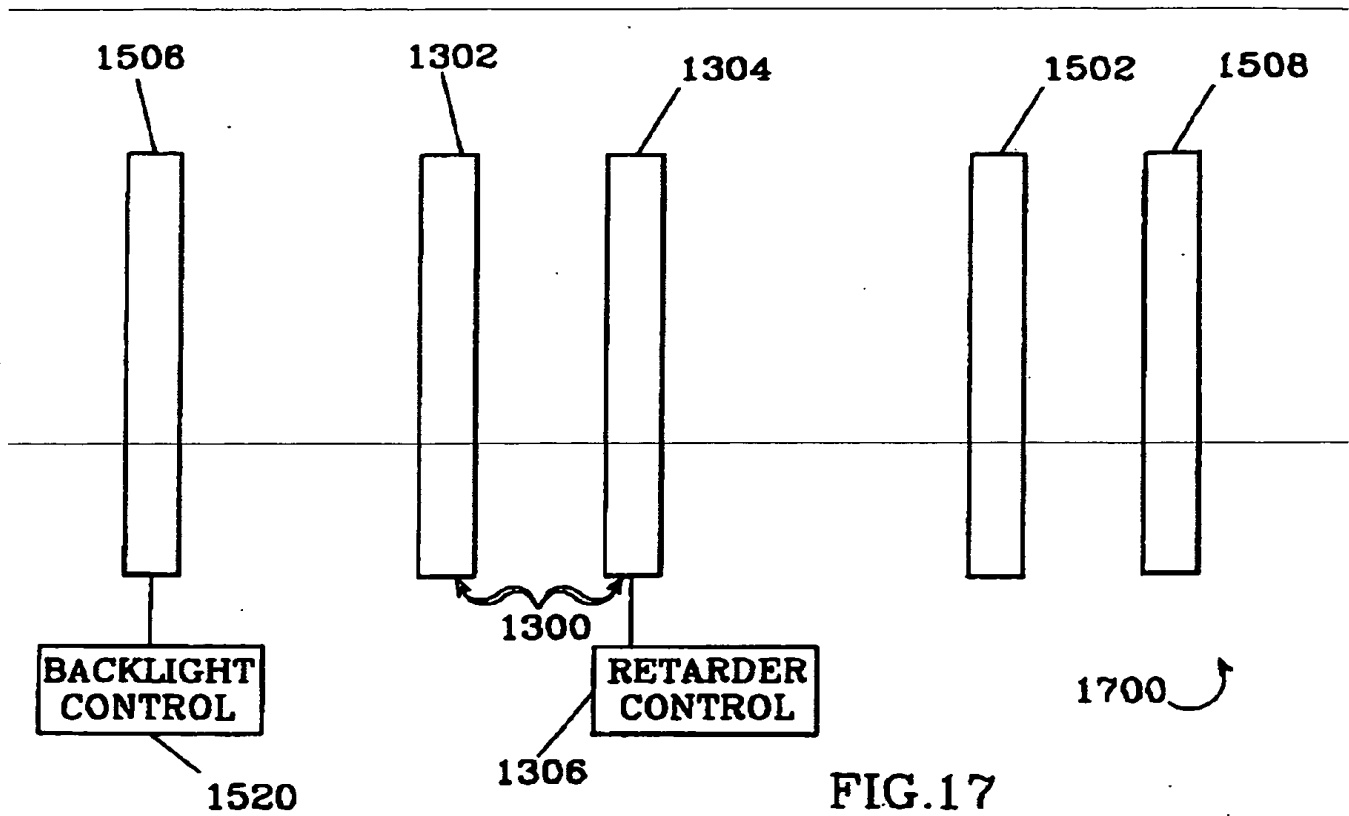


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FIG. 18a

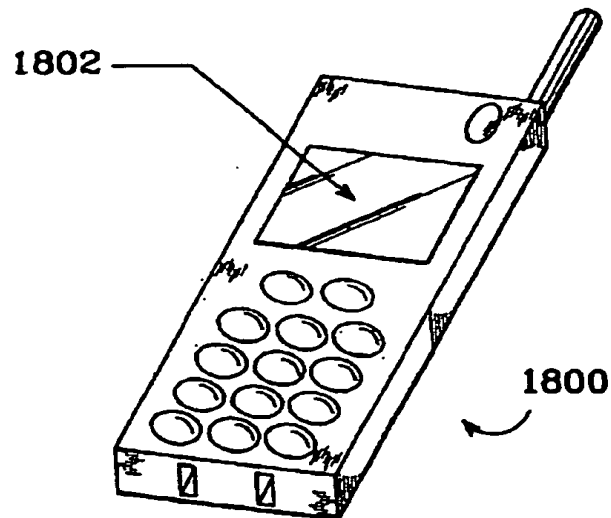


FIG. 18b

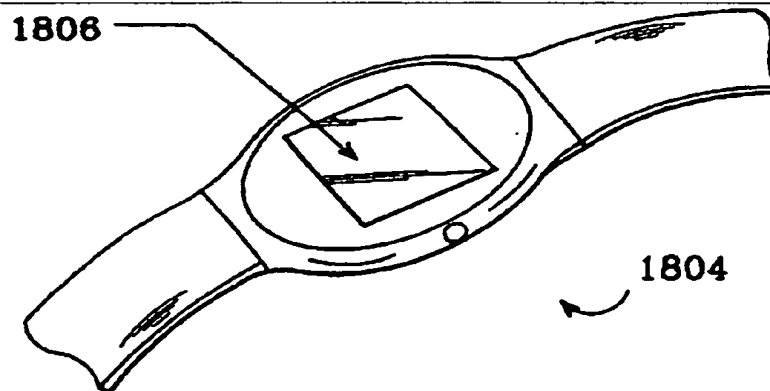


FIG. 18c

